USGS
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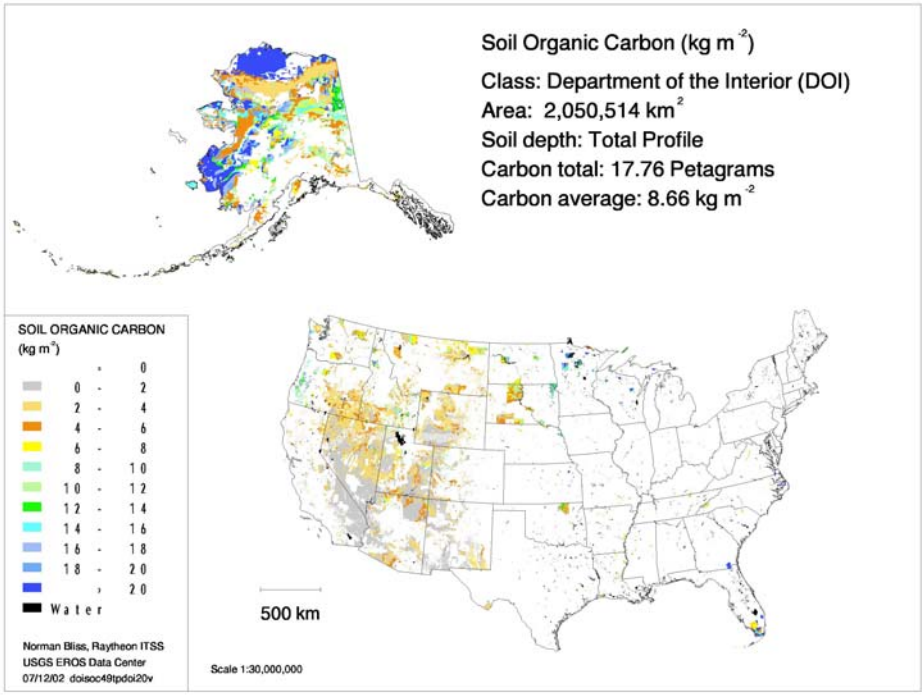
Geographic Analysis and Monitoring Program

Carbon Cycle Project

Statement of Problem

Scientific understanding of carbon cycling is critical to the study of global warming. Through photosynthesis, atmospheric carbon can be stored in the soil, and through microbial respiration, soil carbon can be returned to the atmosphere. Understanding the stocks of carbon on the landscape (soils and biomass) and the fluxes of carbon between the landscape and the atmosphere, is essential so that the impact of land management decisions for both public and private lands can be evaluated in terms of their impacts on carbon sequestration or release.

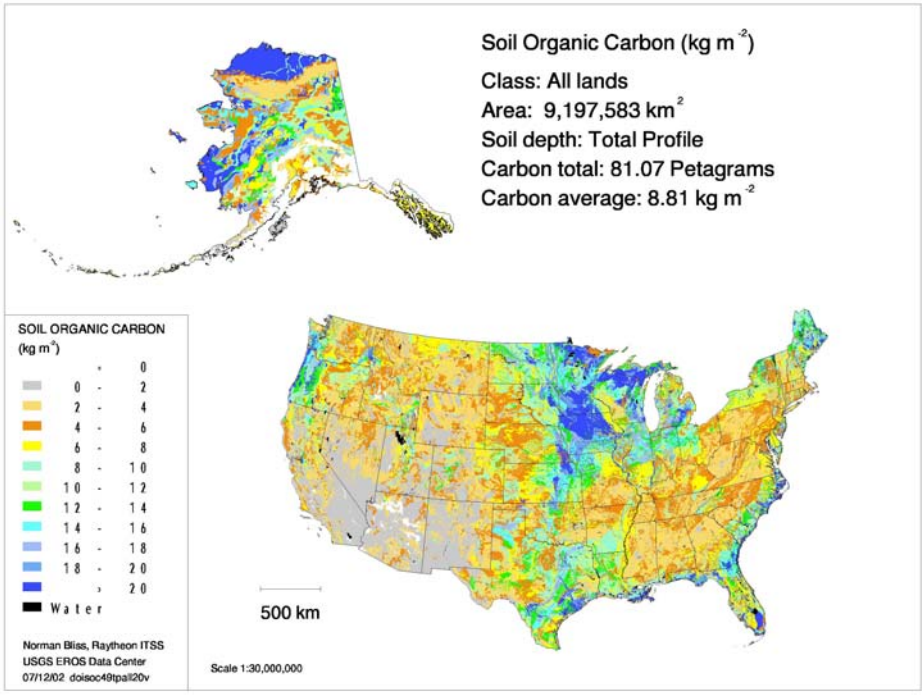


Objectives

The project applies spatial analysis techniques to understanding the stocks and fluxes of carbon on the landscape. The way in which human activities influence carbon in soils and biomass will be evaluated for historical and current time periods, and used to create and test models that will allow prediction of the impacts of future land management decisions on the global carbon cycle.

Relevance and Impact

The carbon cycle is one of the most important of the global biogeochemical cycles. Human modifications of the landscape by agriculture, forestry, reservoir construction, and urbanization have affected the cycle. Understanding how land management decisions affect the carbon cycle will allow better predictions of future trends in greenhouse gas concentrations in the atmosphere, and thus contribute to understanding how humans are changing climate. The USGS participation in this work is guided by the U.S. Carbon Cycle Science Plan, particularly goal 3 to “Determine the impacts of past and current land use on the carbon budget” (Sarmiento and Wofsy, 1999).



Strategy and Approach

Work includes developing and integrating data on soil, geology, land cover, land use history, and climate and using these as input to models of soil erosion, sedimentation, and carbon storage and flux. The Century biogeochemical model has been modified to account for soil erosion and sedimentation. A history of agricultural development has been constructed at the county level from U.S. Census records. The agricultural history will be integrated with data on the land surface to create a spatial-temporal description of changes in the land surface that affect carbon storage and flux. These data and estimates will then be used with the models to reconstruct the past stocks and fluxes of soil and biomass carbon, and provide an analysis tool for evaluating the carbon impacts of future changes. Tasks within this project may apply these techniques at a variety of spatial scales and locations, including very large areas, with the intention to build a capability to perform the analysis globally.

For More Information

Norman B. Bliss
605-594-6034
bliss@usgs.gov